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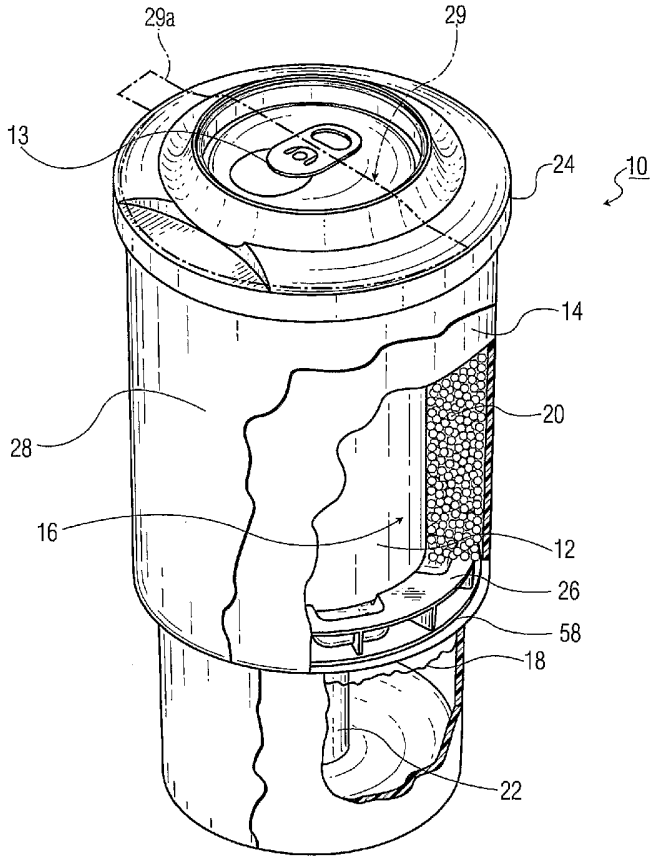
(54) Title: SELF-HEATING/COOLING ARRANGEMENT FOR BEVERAGE AND/OR FOOD



(57) Abstract: An arrangement for heating or cooling a pre-sealed container for beverage and/or food includes a reaction vessel with a reaction volume in which first and second reactants intermix when desired to change the temperature in the reaction volume. A pre-sealed beverage and/or food container thermally contacts the reaction volume, and has a generally tubular shape with a bottom, and a top with means for opening the container. A lid surrounds, and is sealed to, the top portion of the container, for enclosing part of the reaction volume. Confronting surfaces of the top portion of the container and the lid have respective cooperating, portions shaped in an overall tapering manner, more narrow towards the top of the container, so that downward pressure from the lid towards the container substantially aids in holding the container against a bottom support for the container. A seal is positioned between the confronting surfaces.

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SELF-HEATING/COOLING ARRANGEMENT FOR BEVERAGE AND/OR FOOD

Field of the Invention

The present invention relates to an arrangement for beverage and/or food in which the beverage and/or food can be heated or cooled by self-contained structure in the arrangement.

Background of the Invention

A variety of arrangements for self-heating or self-cooling beverage and/or food have been proposed in the prior art. The arrangements typically include a reaction volume in which liquid and solid reactants combine, when desired, to create heat or cold, which is then imparted to a container for beverage and/or food. Often, such containers for beverage and/or food are proprietary in design. This usually increases the overall expense of manufacture since government regulations or standards must be specially met for the proprietary container.

Other prior art arrangements do use containers that are pre-sealed, and possibly are not proprietary in design. But, such arrangements, as shown in US Patent 4,002,235, for instance, have a somewhat complicated construction, which increases their cost.

It would, therefore, be desirable to provide arrangements for self-heating or self-cooling beverage and/or food that use standard, commercially available containers for the beverage and/or food, and which are simple in construction.

Summary of the Invention

In one embodiment, the invention provides an arrangement for heating or cooling a pre-sealed container for beverage and/or food includes a reaction vessel with a reaction volume in which first and second reactants intermix when desired to change the temperature in the reaction volume. A pre-sealed beverage and/or food container thermally contacts the reaction volume, and has a generally tubular shape with a bottom, and a top with means for opening the container. A lid surrounds, and is sealed to, the top portion of the container, for enclosing part of the reaction volume. Confronting surfaces of the top portion of the container and the lid have respective cooperating, portions shaped in an overall tapering manner, more narrow towards the

top of the container, so that downward pressure from the lid towards the container substantially aids in holding the container against a bottom support for the container. A seal is positioned between the confronting surfaces.

In another embodiment of the invention, a mid-ring, separate from the reaction vessel is positioned generally mid-way between top and bottom of the reaction vessel. The mid-ring supports the bottom of the container and is interposed between the bottom of the pre-sealed container and the membrane. Stop structure within the reaction vessel provides a stop to downward movement of the mid-ring.

The foregoing embodiments of the invention provide arrangements for self-heating or self-cooling beverage and/or food that can use standard, commercially available containers for the beverage and/or food. Such arrangements can beneficially have a simple construction.

Description of the Drawings

Fig. 1 is a side view, partially cutaway, partially in cross section and with portions removed, of an exemplary self-heating/cooling arrangement for beverage and/or food according to the invention.

Fig. 2 is a side view, partially cutaway, of a container of the arrangement of Fig. 1.

Fig. 3 is an exploded, top perspective view of the inventive arrangement of Fig. 1, without the temperature-changing reactants shown.

Fig. 4a is an enlarged side view, partially in cross section, of an upper portion of the arrangement of Fig. 1, without the temperature-changing reactants shown; and Fig. 4b is an enlargement of the circled area in Fig. 4a labeled Fig. 4b.

Fig. 5 is a side view, partially in cross section, of a lower portion of the arrangement of Fig. 1

Fig. 6 is s top perspective view of the mid-ring shown in Fig. 5.

Fig. 7 is a top perspective view of the lid of the arrangement of Fig. 1.

Fig. 8 is a fragmentary view, partially in cross section, of a lid, taken at Arrows 8-8 in Fig. 7.

Detailed Description of the Invention

Fig. 1 shows an overview of an inventive arrangement 10 for heating or cooling beverage and/or food in accordance with the invention. Arrangement 10 includes a beverage and/or food container 12 that may have a pop top 13 for opening the container, may be pre-sealed, and may be made of aluminum. Arrangement 10 also includes a reaction vessel 14, preferably of plastic. Reaction vessel 14 includes a reaction volume 16 in thermal contact with container 12, for heating or cooling the contents of the container, depending on the composition of liquid 18 and solid 20 reactants. Reactants 18 and 20 are normally separated from each other by a membrane 58 (Fig. 5), but intermix with each other when membrane 58 is breached by a breaching member 22. A lid 24 is sealed to the top portion of container 12, and is specially contoured to facilitate easy consumption of the contents of the container. The bottom portion of the container may rest, directly or indirectly, against a so-called "mid-ring" 26 (i.e., a shortened version of "mid-vessel ring"). A label 28, preferably of heat-shrink construction, covers the outside of generally tubular reaction vessel 14, and can provide enough thermal insulation to prevent a user's hand holding the label from uncomfortable temperatures.

A spritz guard 29 is mounted over pop-top 13 for containing an outburst, or spritz, of beverage from container 12 that may occur after shaking the container in an operation (described below) for heating or cooling the contents of container 12. Spritz guard 29 preferably comprises a removable, pressure-sensitive label that is supple. One example is 2 mil thick polypropylene. A user pulls upwardly on tab 29a—which lacks adhesive—to remove the spritz guard. This would be accomplished, as written on the spritz guard itself, by instructions such as: "Break open the Pop Top [13] before peeling of this Spritz Guard consumer protection label." As will be apparent from the present specification, a consumer would open pop top 13 after a heating or cooling operation has occurred.

Reaction vessel 14 and mid-ring 26 preferably comprise high impact polystyrene. Spritz guard 29 preferably comprises a pressure-sensitive, removable label.

A typical heating or cooling operation of arrangement 10 proceeds in the following sequence: Invert the arrangement (i.e., turn it upside-down), and then breach membrane 58, which is explained below, which causes liquid reactant 18 to start intermixing with solid reactant 20. Then, shake the arrangement vigorously for at least about 45 seconds, which assists in thermal transfer between the reactants

and the contents of container 12, so that the contents more uniformly become heated or cooled to a desired temperature. The beverage and/or food in the container will typically reach a desired temperature for consumption within a few minutes.

The following description elaborates on the foregoing aspects of the inventive arrangements under the following three topics: (1) mounting of container 12; (2) novel lid topology; and (3) thermally insulative label.

1. Mounting of Container 12

Container 12 is preferably mounted in arrangement 10 through mechanical pressure, and preferably without adhesive. Such mounting can occur by suitable shaping of the container and associated lid 24 (Fig. 1).

Container 12 is preferably a pre-sealed aluminum can, such as commercially prevalent for soft drinks or beer. By being pre-sealed, containers can be used in the inventive arrangement that have already passed all governmental regulations and standards for safely sealing beverage and/or food. Referring to Fig. 2, container 12 has a bottom portion 12a and a top portion 12b. Top portion 12b has a so-called "necked-in" region 30 below a double-seamed end 32, and a "shoulder" portion 12e below necked-in region 30. Double-seamed end 32 connects a top 12c of the container to a main body 12d of the container. The necked-in region causes top portion 12b of the container to be shaped in an overall tapering manner, more narrow towards the top of the container. Manufacturers of aluminum cans often reduce the amount of metal required to make a main body (e.g., 12d) of a can, below a double-seamed end (e.g., 32), by accentuating the amount of necking-in of the can. If the main body of the can is thin, the accentuated necking-in at the top of the can assures the presence of adequate metal required to form a proper double-seamed end. In any event, cans shaped in the desired, overall tapering manner are commercially quite prevalent.

Fig. 3 shows various parts of arrangement 10 of Fig.1 that can mount container 12 by mechanical pressure. Lid 24, preferably with the aid of a gasket 36, applies downward pressure onto the top portion (12b, Fig. 2) of the container. Meanwhile, the bottom portion (e.g., 12a, Fig. 2) of the container is pressed upwardly by mid-ring 26. Mid-ring 26, in turn, may rest on an annular shelf in the vicinity of stepped region 42 of reaction vessel 14.

Details of how lid 24 interacts with the top portion of container 12 and how mid-ring 26 interacts with the bottom of the container are now described.

As mentioned in connection with Fig. 2, top portion 12b of container 12 is shaped in an overall tapering manner, more narrow towards the top of the container. Referring to Figs. 4a and 4b, this is true in vertical region 46 of arrangement 10. In a cooperating manner, surface 48 of lid 24, which confronts top portion 12b of the container, is also shaped in an overall tapering manner, more narrow towards the top of arrangement 10. The mentioned configurations of the cooperating, confronting surfaces of the lid (i.e., surface 48) and of top portion 12b of the container are chosen with respective dimensions so that downward pressure from the lid towards the container substantially aids in holding the container against a bottom support for the container—e.g., mid-ring 26 (Fig. 3). Further, dimension 49 of lid 24 (Fig. 4a) may be about 40 mils less than dimension 47 of container 12. This further causes the lid to hold the container downwardly in arrangement 10.

Preferably, gasket 36 provides a watertight seal between top portion 12b of the container and lid 24. Gasket 36 cooperates with the cooperating, tapered configurations of the container and lid to hold the container downwardly against mid-ring 26 (Fig. 3), for example. As shown in Fig. 3, prior to installation, gasket 36 may comprise a flat, annular band of compressible material, such as foamed plastic (e.g., foamed polyethylene) with a typical thickness between about 20 and 40 mils. Such material is commercially available as Part No. F-217, with a density of 23-27 pounds per cubic foot, from Tri-Seal, a division of TEKNIplex Co. of Blauvelt, New York. Inner diameter 36a (Fig. 3) of unflexed gasket 36 preferably is substantially smaller than diameter 47 (Fig. 4a) of the top portion of the container. For instance, inner diameter 36a of the gasket, before being stretched over the container, may be 1.5 inches, the outer diameter of the gasket, 2.225 inches, and container diameter 47, 2.050 inches, using the 20-mil foamed polyethylene gasket from TEKNIplex Co., as just discussed.

Making inner diameter 36a (Fig. 3) of the gasket substantially smaller than outer diameter 47 (Fig. 4a) of the top portion of the container yields a beneficial result. That is, the gasket may be placed into the position shown in Figs. 4a and 4b, with the gasket forming a substantially unpleated skirt around the top portion of the container. Such a shape avoids unwanted pleats in the gasket that would interfere with obtaining a reliable, watertight seal between lid 24 (Fig.4) and the container.

For simplicity of manufacture, gasket 36 alone can fulfill the requirement of obtaining a watertight seal between lid and container. Thus, adhesive (not shown)

need not be used in addition to a gasket. However, adhesive could be used to obtain a watertight seal, with or without a gasket, without departing from the invention.

Referring to Fig. 4b, the seal between lid 24 and container 12 is preferably formed by the squeezing of gasket 36 between a "shoulder" portion 12e of the container and an adjacent portion of the lid.

Referring to Figs. 4a and 4b, the upper portion of reaction vessel 14 may be ultrasonically sealed to lid 24 in the areas shown at 50. This will prevent accidental release of the contents of reaction volume 16 from reaction vessel 14. A reliable weld can be easily achieved especially with vessel 14 and lid 24 both made of high impact polystyrene.

Figs. 5 and 6 show details of mid-ring 26 to aid in explaining its function of supporting bottom portion 12a of container 12, as well as explaining further functions of the mid-ring. As shown, mid-ring 26 is contoured to support bottom portion 12a of the container. In particular, as shown in Fig. 6, mid-ring 26 has an annular channel, e.g., 26a, that receives lowermost, annular extension 54 (Fig. 5) of the container. This provides a reliable hold on the container. At the same time, channel regions 26b in the mid-ring, in cooperation with a central, vertical aperture 26c (Fig. 6) in the mid-ring, enable passage of liquid reactant, when desired, from one side of the mid-ring to the other—or, from the perspective of Fig. 6, from below mid-ring 26 to above the mid-ring.

Mid-ring 26 provides another important function; that is, to make breaching member 22 effective. As shown in Fig. 5, mid-ring 26 may rest, indirectly (via membrane 58), on an annular shelf 14a of reaction vessel 14, in the vicinity of stepped region 42 of the reaction vessel. Membrane 58, which may be a laminated induction heat seal, may extend for 225 mils, for instance on annular shelf 14a. Other thicknesses for the membrane can be used, if desired. Referring to Fig. 5, breaching member 22 can reliably breach the membrane when moved upwardly in the reaction vessel, by having the mid-ring 26, which may have an aperture 26c of dimension 60, rest atop membrane 58. Breaching member 22 will move upwardly in the vessel when a user presses upwardly on lower, concave surface 14b of the reaction vessel.

Further, membrane 58 cannot resist breaching by bulging upwardly as would be the case without the mid-ring over it, by having mid-ring 26 situated atop membrane 58, with a relatively smaller aperture 26c for passage therethrough by

breaching member 22. Additionally, the membrane is more reliably pierced by breaching member 22, allowing a thicker membrane to be used so as to avoid premature piercing of the membrane.

In more detail, mid-ring 26 effectively reduces the unsupported surface area of the membrane from that of dimension 62, the maximum horizontal dimension of the unsupported part of the membrane that is typically of 2.55-inch, to dimension 60, which is typically one inch. With membrane 58 typically being 3 inches in diameter, aperture 26c preferably covers less than about 25 percent of the full area of the membrane, and more preferably less than about 15 percent of the full area of the membrane. Further, dimension 64 of breaching member 22, which is the maximum horizontal dimension of the breaching member, is preferably at least about 60 percent of dimension 60 of aperture 26c of the mid-ring, and more preferably at least about 75 percent of such dimension. This helps assure that breaching member 22 reliably breaches the membrane with only a short distance of movement.

Mid-ring 26 is also designed to slow the flow of intermixed reactants 18 and 20 from reaction volume 16 back below membrane 58 after the membrane has been breached by breaching member 22. This is desirable to assure that: (1) liquid 18 and solid 20 reactants intermix thoroughly to achieve the desired heating or cooling reaction and (2) that the intermixed reactants 18 and 20 conduct thermal transfer to the contents of container 12 for a prolonged period of time. With reference to Figs. 5 and 6, mid-ring 26 slows down the flow of the intermixed reactants 18 and 20 through two features. First, it restricts the flow of the intermixed reactants to a principal path that includes peripheral portions 26d of channel regions 26b, exterior to container 12, and, second, it restricts such flow to aperture 26c, which has a smaller diameter than the diameter of the mid-ring.

Suitable materials for membrane 58 will be apparent to those of ordinary skill in the art. One possibility is a laminated adhesive-aluminum foil-white paper sold by TRI-SEAL, a TEKNIplex Company, of Flemington, New Jersey, as Part No. HS 405. Such membrane has an adhesive thickness of about 2 mils, a foil thickness of about 0.35 mils, and a white paper thickness of about 3 mils, for a total thickness of about 5.35 mils.

2. Novel Lid Topology

Figs. 7 and 8 show additional details of a novel topology for lid 24 of Fig. 1. As shown in Figs. 7-8, lid 24 has an upwardly and outwardly facing surface 24a that

surrounds a top portion of the container 12. Figs. 4a and 4b show another cross section of the lid, in which surface 24a can be seen surrounding container 12. Surface 24a typically extends upwardly at an angle from straight upward between about 5 and 45 degrees, and more preferably with a lower angle of 10 degrees and a higher angle of 20 degrees. Some portion of surface 24a beneficially receives the lower lip of the mouth of a person consuming the contents of the container. Preferably, surface 24a receives more than about 9.5 mm of a consumer's lip, and may be extended to receive a greater extent of a consumer's lip, such as 13 mm.

Referring to Figs. 4, 7, and 8, surface 24b of the lid cooperates with surface 24a to form a trough 24c, which beneficially collects contents of the container that spill over the top of the container. Typically, a 10-centimeter length of trough 24c can hold between about 1 and 3 milliliters of volume of contents from the container when the container is vertically upright.

To facilitate consumption of the contents of the container without spilling the contents from arrangement 10, lid 24 preferably also includes another lip-receiving surface region 24d. Region 24d includes a concave surface 24e, which is generally vertical, and another surface 24f, which may be flat, for instance. As best shown in Fig. 8, region 24d forms a drain from trough 24c, which preferably can drain substantially all of the trough.

Regarding the foregoing novel topology of the lid, precise shaping of surfaces 24a and 24b—and hence shaping of trough 24c—can be considerably varied within the scope of the invention. Further, the precise shaping of lip-receiving region 24d can be also considerably varied within the scope of the invention.

3. Thermally Insulative Label

Figs. 1 and 3 show label 28, which, as mentioned above, is preferably of heat-shrink construction. Label 28 beneficially may perform a thermal-insulating function with respect to the reactants 18 and 20 that, when intermixed, undergo a change in temperature.

As shown in the pre-assembly version of Fig. 3, label 28 may be tubular in shape. Upon being shrunk in a known heating process onto reaction vessel 14 and lid 24, label 28 appears as in Fig. 1, and is generally tubular in shape. Label 28 may be formed of polyvinyl chloride (PVC), for instance, preferably of at least about 2.7 mils thickness before being heat shrunk, but can possibly have a lesser thickness. Label 28 is preferably heat shrunk onto reaction vessel 14 without adhesive.

Heat-shrink label 28, without adhesive, will aid in keeping the lateral outside of the inventive arrangement—and more particularly the outside of reaction vessel 14—from becoming uncomfortably hot or uncomfortably cold. If adhesive is used, the thermal isolative quality of the label drops considerably. The thickness of the label and lack of adhesive for affixing the label aids in providing robust thermal isolation from the heat or cold generated within the reaction vessel.

The lateral outside of the inventive arrangement will stay within a comfortable temperature range of below about 120 F, and more preferably below about 115 F, by (1) applying a heat-shrink label 28 from about 2.0 to 2.7 mils thick PVC, without using adhesive; and (2) forming the lateral outside of reaction vessel 14 with 30- to 60-mil thick high-impact polystyrene, by way of example. Materials other than high-impact polystyrene, which apparently has a substantial content of rubber so as to reduce thermal conductivity, can be used for the lateral outside of the reaction vessel, as will be apparent to those of ordinary skill in the art.

By way of example, if a solid reactant 20 (Fig. 1) of 148 grams calcium chloride ($CaCl_2$) is mixed with 140 grams of water as liquid reactant 18 (Fig. 1), the temperature of 6.5 ounces of liquid beverage within container 12 will reach 140 F (i.e., 140 degrees Fahrenheit) typically within a brief period of time (e.g., 60 seconds). This represents a temperature change of about 70 degrees from a normal ambient temperature of 70 F. The calcium chloride reactant may that identified as BRINERS Choice Anhydrous 94-97% Calcium Chloride Mini-Pellets, available from Dow Chemical Company of Midland, Michigan.

While the invention has been described with respect to specific embodiments by way of illustration, many modifications and changes will occur to those skilled in the art. For instance, directions of the claimed arrangements, such as top and bottom, downward and upward, and horizontal are relative directions used for illustrative purposes only. It is contemplated that the claimed arrangements may be used in positions other than vertically upwards as shown in Fig. 1, for instance. Thus, a person of ordinary skill in the art will readily realize that a statement such as "the lid presses downwardly on the container" will still apply even though the container is rotated 90 degrees from the position shown in Fig. 1. It is, therefore, to be understood that the appended claims are intended to cover all such modifications and changes as fall within the true scope and spirit of the invention.

What is claimed is:

1. An arrangement for heating or cooling a pre-sealed container for beverage and/or food, comprising:
   a) a reaction vessel with a reaction volume in which first and second reactants intermix when desired to change the temperature in the reaction volume;
   b) a pre-sealed beverage and/or food container in thermal contact with the reaction volume; the container having a generally tubular shape with a bottom, and a top with means for opening the container;
   c) a bottom support for supporting the bottom of the container;
   d) a lid, surrounding the top portion of the container, for enclosing part of the reaction volume;
   e) confronting surfaces of the top portion of the container and the lid having respective cooperating, portions shaped in an overall tapering manner, more narrow towards the top of the container, so that downward pressure from the lid towards the container substantially aids in holding the container against the bottom support; and
   f) a seal between the confronting surfaces.
2. The arrangement of Claim 1, wherein the confronting surfaces of the container and the lid are so shaped that downward pressure from the lid towards the container substantially fully holds the container against the bottom support.
3. The arrangement of Claim 1, wherein the seal comprises a compressible gasket.
4. The arrangement of Claim 3, wherein seal is principally formed by squeezing the gasket between a shoulder portion of the container and an adjacent portion of the lid.
5. The arrangement of Claim 3, wherein, in its initial unflexed state, the gasket is a flat annular band whose inner diameter is sufficiently smaller than the top portion of the container over which the gasket extends, so that the gasket forms a substantially unpleated skirt when initially placed over the top portion of the container.
6. The arrangement of Claim 5, wherein the compressible gasket comprises foamed plastic.
7. The arrangement of Claim 6, wherein the compressible plastic comprises foamed polyethylene.

8. The arrangement of Claim 7, wherein the foamed polyethylene is at least about 20 mils thick in its initial, uncompressed state before being placed on the container.

9. The arrangement of Claim 1, wherein the seal is free of adhesive.

10. The arrangement of Claim 9, wherein the seal further comprises compressible material.

11. The arrangement of Claim 1, wherein the top portion of the container comprises a necked-in region and a double-seamed end above the necked-in region.

12. The arrangement of Claim 11, wherein the can is made from aluminum.

13. The arrangement of Claim 1, further comprising a removable spritz guard placed over a location on the top of the container from which contents of the container can be removed.

14. The arrangement of Claim 13, wherein the spritz guard comprises a removable, pressure-sensitive label.

15. An arrangement for heating or cooling a pre-sealed container for beverage and/or food, comprising:

a) a reaction vessel with a reaction volume in which first and second reactants intermix when desired to change the temperature in the reaction volume

b) a pre-sealed beverage and/or food container in thermal contact with the reaction volume; the container having a generally tubular shape with a bottom, and a top with means for opening the container;

c) a membrane for separating the first and second reactants prior to intermixing the reactants in the reaction volume;

d) a breaching member for breaching the membrane, to initiate intermixing of the reactants, when desired;

e) the mid-ring being interposed between the bottom of the pre-sealed container and the membrane; the mid-ring supporting the bottom of the container; and

f) stop structure within the reaction vessel providing a stop to downward movement of the mid-ring.

16. The arrangement of Claim15, wherein the top of the container comprises a necked-in region and a double-seamed end above the necked-in region.

17. The arrangement of Claim 16, wherein the container rests against the mid-ring without being affixed thereto and the mid-ring rests against the stop structure without being affixed thereto.

18. The arrangement of Claim 17, wherein the container rests directly against the mid-ring.

19. The arrangement of Claim 15, wherein the membrane is supported on the stop structure; the stop structure comprising an annular surface on the interior of the reaction vessel.

20. The arrangement of Claim 15, wherein the mid-ring is configured to allow reactants to be transported through substantial channels, when desired, from one side of the mid-ring to the other when the container bottom is supported by the mid-ring.

21. The arrangement of Claim 15, wherein the mid-ring serves to provide substantially the entire support for the bottom of the container.

22. The arrangement of Claim 21, wherein the mid-ring presses the container upwardly within the reaction vessel without being affixed to the container.

23. The arrangement of Claim 22, wherein the mid-ring is not affixed to the stop structure that stops downward movement of the container.

24. The arrangement of Claim 15, wherein the mid-ring presses the container upwardly within the reaction vessel.

25. The arrangement of Claim 15, wherein the mid-ring overlies the membrane, and has a generally vertical aperture for receiving the breaching member when breaching of the membrane is desired; the aperture overlying a partial area of the membrane, substantially less than the full area of the membrane, to reduce the extent of movement of the breaching member required for breaching the membrane.

26. The arrangement of Claim 25, wherein flow of liquid reactant from the reaction volume to below the membrane is slowed by restricting the liquid reactant to a principal path from laterally outside the lower edge of the container, through channel regions in the mid-ring below the container, and, via the aperture of the mid-ring, to a volume below the mid-ring.

27. The arrangement of Claim 25, wherein the partial area is less than about 25 percent of the full area of the membrane.

28. The arrangement of Claim 27, wherein the partial area is less than about 15 percent of the full area of the membrane.

29. The arrangement of Claim 25, wherein the maximum horizontal dimension of the breaching member is at least about 60 percent of the maximum horizontal dimension of the generally vertical aperture of the mid-ring.

30. The arrangement of Claim 25, wherein the maximum horizontal dimension of the breaching member is at least about 75 percent of the maximum horizontal dimension of the generally vertical aperture of the mid-ring.

31. An arrangement for heating or cooling a pre-sealed container for beverage and/or food, comprising:

a) a reaction vessel with a reaction volume in which first and second reactants intermix when desired to change the temperature in the reaction volume;

b) a pre-sealed beverage and/or food container in thermal contact with the reaction volume; the container having a generally tubular shape with a bottom, and a top with means for opening the container;

c) a bottom support for supporting the bottom of the container;

d) a lid, surrounding the top portion of the container and sealed to the top portion of the container, for enclosing part of the reaction volume; the lid including an upper, outwardly-facing, lip-receiving surface that surrounds a top portion of the container; the lip-receiving surface receiving a portion of a lower lip of the mouth of a person consuming the contents of the container.

32. The arrangement of Claim 31, wherein the wherein the top portion of the container comprises a double-seamed end.

33. The arrangement of Claim 32, wherein the top portion of the container comprises a necked-in region below the double-seamed end.

34. The arrangement of Claim 32, wherein the container is made of metal.

35. The arrangement of Claim 34, wherein the metal is aluminum.

36. The arrangement of Claim 31, wherein the lip-receiving surface extending upwardly at an angle from straight upward between about 5 and 45 degrees.

37. The arrangement of Claim 31, wherein the angle is between about 10 and 20 degrees.

38. The arrangement of Claim 31, wherein the lip-receiving surface of the lid extends upwardly so as to allow more than about 5 mm of the lower lip of a person to be received thereby.

39. The arrangement of Claim 38, wherein the lip-receiving surface of the lid extends upwardly so as to allow between about 5 to 15 mm of the lower lip of a person to be received thereby.

40. The arrangement of Claim 31, wherein the lid includes a further lip-receiving surface located near the bottom of the first-mentioned lip-receiving surface; the further lip-receiving surface having a concave surface for receiving a portion of the lower lip of the mouth of a person consuming the contents of the container.

41. The arrangement of Claim 40, wherein the further lip-receiving surface includes a substantially horizontal surface below the concave surface for receiving a portion of the lower lip of the mouth of a person consuming the contents of the container.

42. The arrangement of Claim 31, wherein the upper surface of the lid is so shaped as to form a trough for collecting spilled contents of the container; one wall of the trough comprising a lower part of the lip-receiving surface.

43. The arrangement of Claim 42, wherein a 10-centimeter length of the trough holds a volume of more than about 1 milliliter of volume of contents from the container when the container is vertically upright.

44. The arrangement of Claim 43, wherein the volume is less than about 3 milliliters.

45. The arrangement of Claim 42, wherein the trough has a drain region for allowing contents of the trough to flow into the mouth of a person consuming the contents of the container.

46. The arrangement of Claim 45, wherein the drain region has a concave surface for receiving a portion of the lower lip of the mouth of a person consuming the contents of the container.

47. The arrangement of Claim 46, wherein the drain is so constructed that substantially all the contents of the trough would flow through the drain if the arrangement is placed on a level surface.

48. The arrangement of Claim 46, wherein the drain further includes a substantially horizontal surface below the concave surface for receiving a portion of the lower lip of a person consuming the contents of the container.

49. An arrangement for heating or cooling a pre-sealed container for beverage and/or food, comprising:

a) a container for beverage and/or food whose temperature is desired to be substantially changed to a temperature before being consumed;

b) a reaction vessel with a generally tubular exterior surface; the vessel having a reaction volume in which first and second reactants intermix when desired to change the temperature in the reaction volume; the reaction volume being in thermal contact with the beverage and/or food container in such manner as to change the temperature of the beverage and/or food at least about 50 degrees F before the beverage and/or food is consumed; and

c) a label on the generally tubular exterior surface of the reaction vessel; the label being affixed to the exterior surface substantially only by heat shrinking, so as to minimize thermal transfer from the reaction volume to the surface of the label;

d) the reaction vessel and the label being so constructed that the temperature of the outside of the label does not exceed about 120 degrees Fahrenheit.

50. The arrangement of Claim 49, the reaction vessel and the label are so constructed that the temperature of the outside of the label does not exceed about 115 degrees Fahrenheit.

51. The arrangement of Claim 49, wherein the polystyrene has a thickness of less than about 60 mils.

52. The arrangement of Claim 51, wherein the polystyrene has a thickness of less than about 30 mils.

53. The arrangement of Claim 49, wherein the reaction volume thermally contacts the beverage and/or food container in such manner as to change the temperature of the beverage and/or food from 70 degrees Fahrenheit at least about 70 degrees Fahrenheit higher before the beverage and/or food is consumed.

54. The arrangement of Claim 49, wherein the reaction vessel is made of high impact polystyrene.

55. The arrangement of Claim 49, wherein the label is made of polyvinyl chloride.

56. The arrangement of Claim 55, wherein the label is at least about 2.7 mils thick.

57. An arrangement for heating or cooling a pre-sealed container for beverage and/or food, comprising:

a) a reaction vessel with a reaction volume in which first and second reactants intermix when desired to change the temperature in the reaction volume;

b) a membrane for separating the first and second reactants prior to intermixing the reactants in the reaction volume;

c) a breaching member for breaching the membrane, to initiate intermixing of the reactants, when desired;

d) a pre-sealed beverage and/or food container in thermal contact with the reaction volume; the container having a generally tubular shape with a bottom, and a top with means for opening the container;

e) a lid, surrounding the top portion of the container and sealed to the top portion of the container, for enclosing part of the reaction volume;

f) confronting surfaces of the top portion of the container and the lid having respective cooperating, portions shaped in an overall tapering manner, more narrow towards the top of the container, so that downward pressure from the lid towards the container substantially aids in holding the container against the bottom support; and

g) a seal between the confronting surfaces;

h) a mid-ring, separate from the reaction vessel and being positioned generally mid-way between top and bottom of the reaction vessel; the mid-ring supporting the bottom of the container; the mid-ring being interposed between the bottom of the pre-sealed container and the membrane; and

i) stop structure within the reaction vessel providing a stop to downward movement of the mid-ring.

58. The arrangement of Claim 57, wherein the lid includes an upper, outwardly-facing, lip-receiving surface that surrounds a top portion of the container; the lip-receiving surface receiving a portion of a lower lip of the mouth of a person consuming the contents of the container.

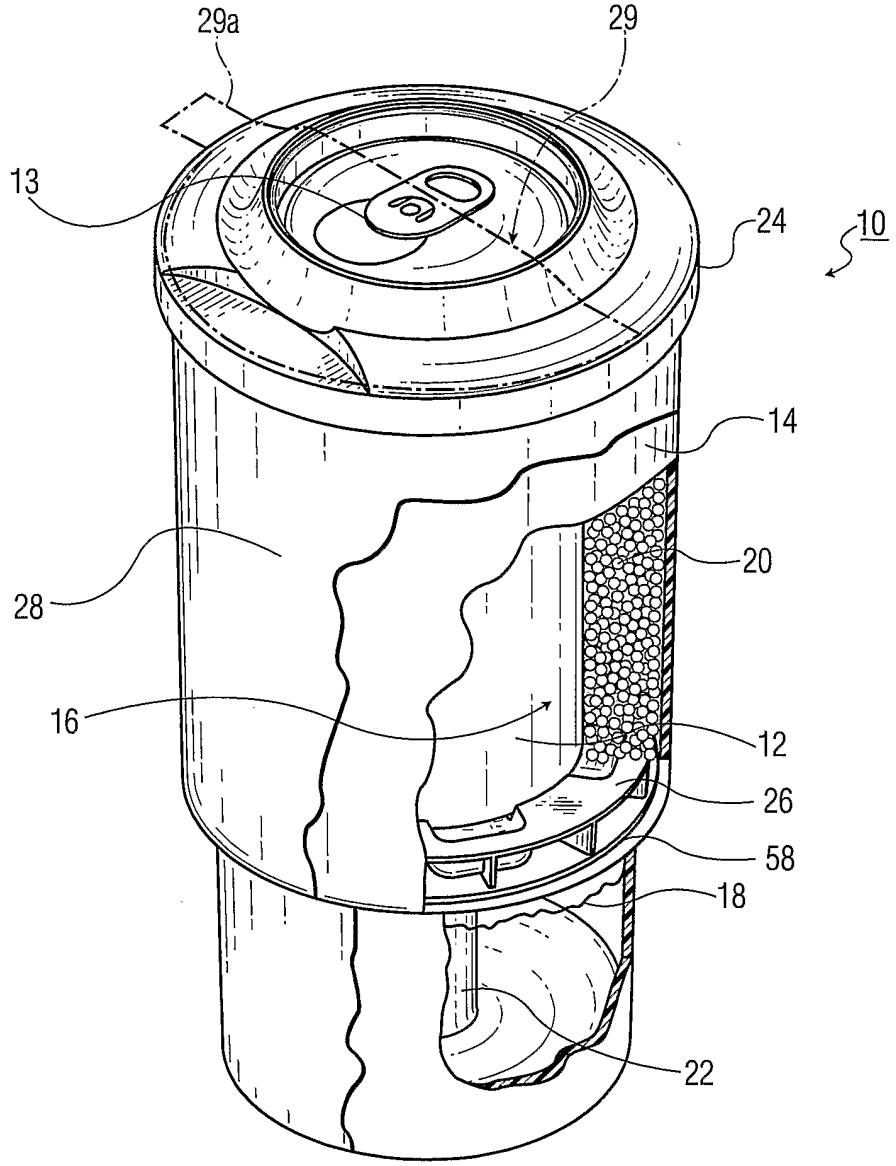

FIG. 1

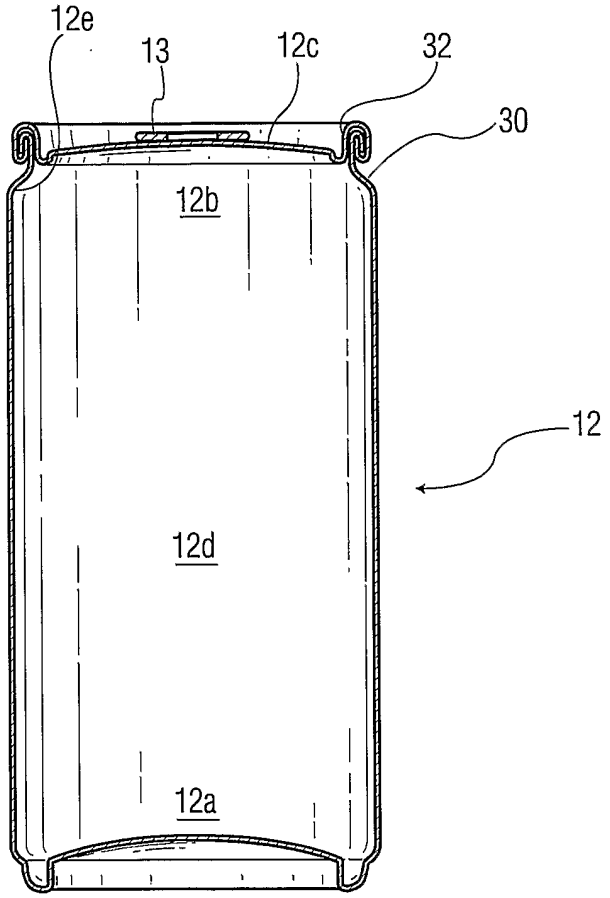

FIG. 2

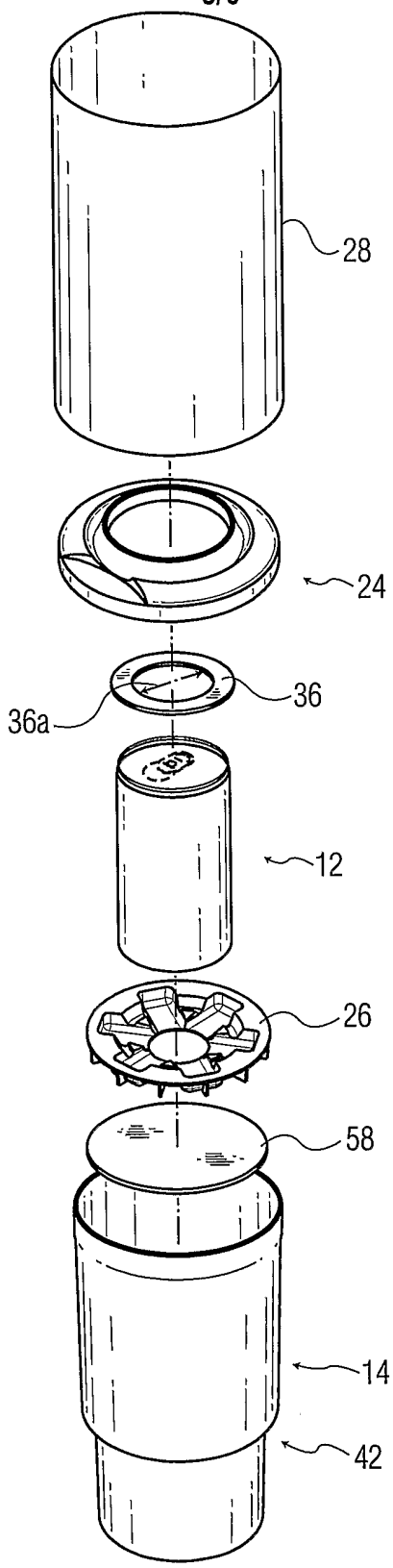

FIG. 3

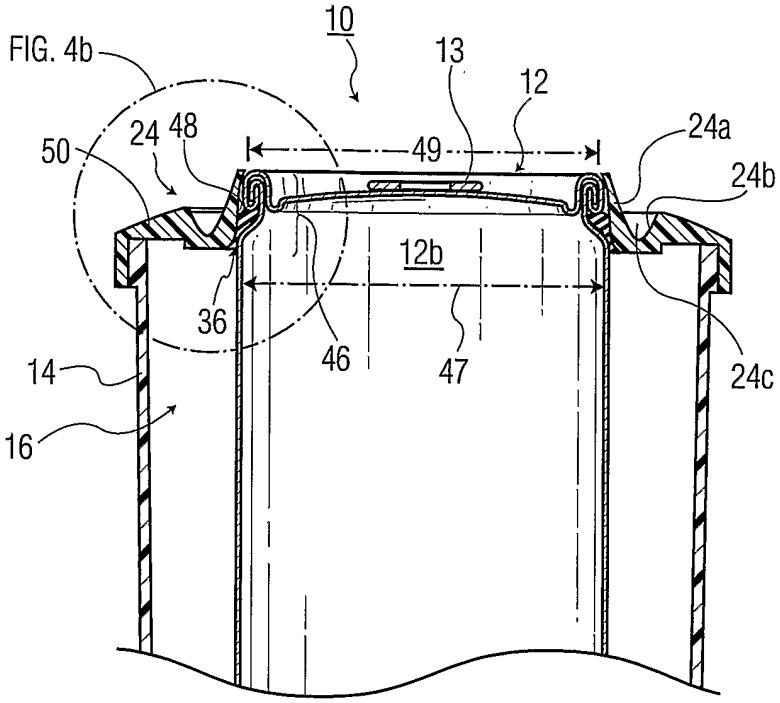
FIG. 4b
10
13
12
24
48
49
24a
24b
50
12b
36
46
47
24c
14
16

FIG. 4a

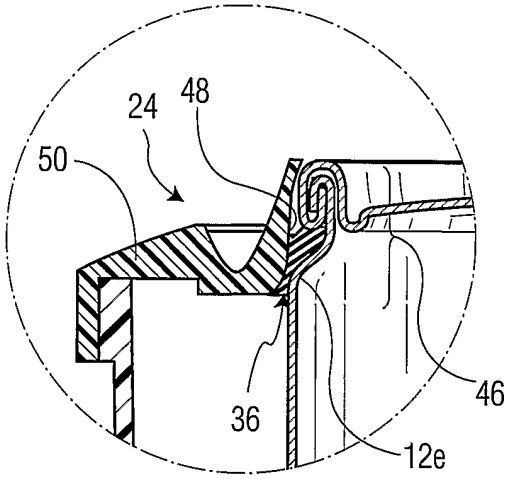
24
48
50
36
46
12e

FIG. 4b

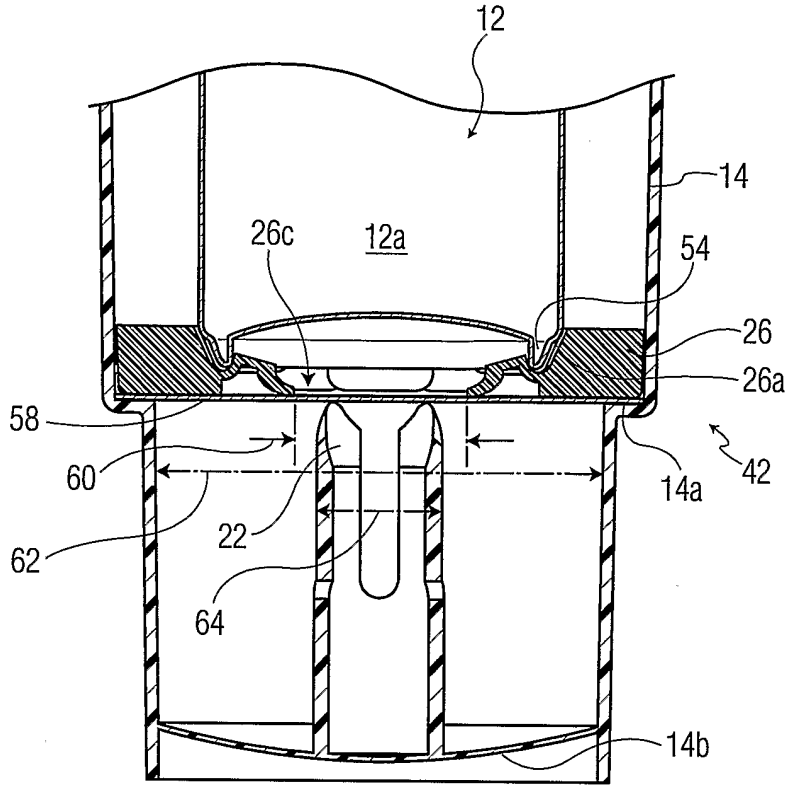
12
14
26c
12a
54
26
26a
58
60
62
22
64
42
14a
14b

FIG. 5

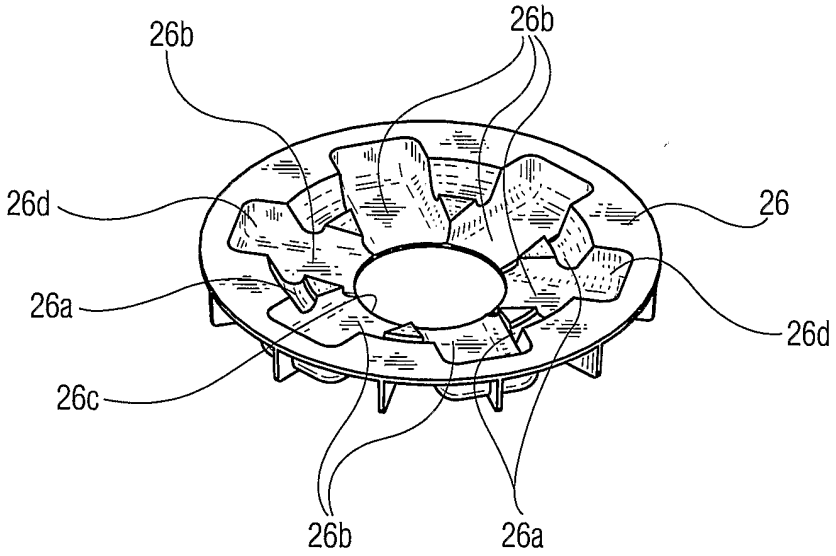
26b
26b
26d
26
26a
26d
26c
26b
26a

FIG. 6

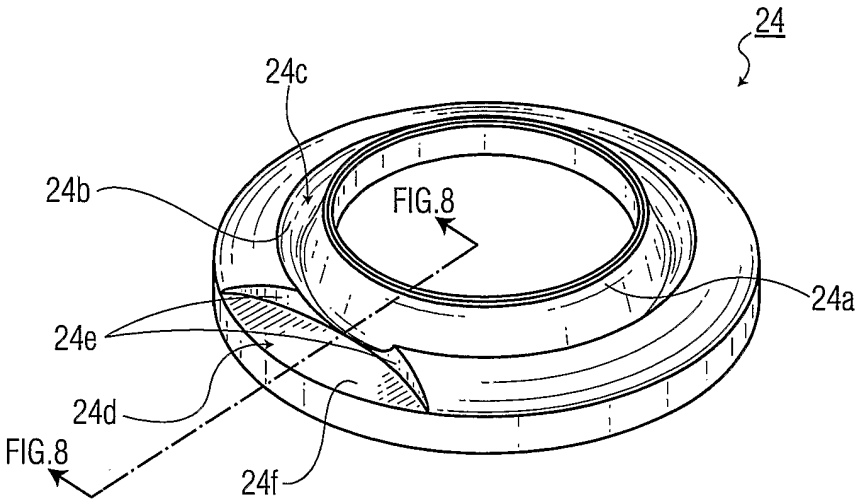

FIG. 7

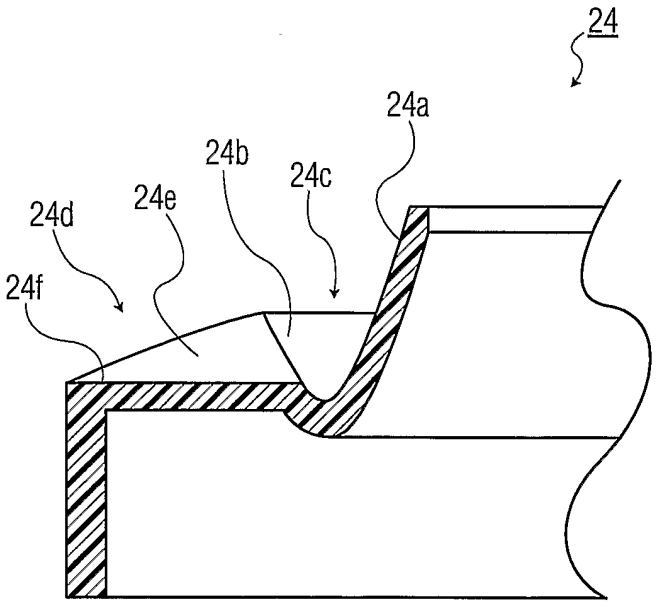

FIG. 8